higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

FITTING AND MACHINING THEORY N1

2 AUGUST 2019

This marking guideline consists of 7 pages.

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SECTION A: GENERAL PRACTICE

QUESTION 1: OCCUPATIONAL SAFETY

1.1
- Ensure that all machinery used is fit for purpose and installed, operated and maintained in such a manner to prevent the exposure of persons to danger.
- Safeguard exposed and dangerous parts of machinery effectively.
- Ensure that safety equipment is in good working order.
- Ensure that the quality of materials used for machines or safety equipment is suitable for the purpose for which it was intended.
- Ensure that entrances to areas where machines constitute a danger to persons are enclosed and locked.
- Ensure that no unauthorised person removes any safety equipment from a machine. (Any 5 × 1) (5)

OR

1.2 1.2.1
- Keep clean.
- Ventilate adequately.
- Prevent liberation of dust into the atmosphere. (3)

1.2.2
- Water or other dust-allaying agents
- Dust-extraction system (2)

[5]

QUESTION 2: MEASURING INSTRUMENTS

2.1
- Scribing of lines that must be accurate to each other
- Accurate determination of heights as with the sine bar
- Accurate setting up of workpieces (3)

2.2 2.2.1 Vernier scale
2.2.2 Main scale
2.2.3 Blade
(3 × 1) (3)

2.3 The vernier protractor is used in all types of work where angles are to be laid out✓ or measured to within 5'.✓ (2)

2.4 The telescopic gauge is used to obtain the size of holes,✓ slots and recesses.✓ (2)

2.5 0,05 mm (1)

[11]

QUESTION 3: SCREW THREADS

3.1 3.1.1 It is a helical groove cut in a cylindrical rod✓ used on bolts, set screws and studs.✓

3.1.2 It is a helical groove cut in a round hole✓ mainly used for nuts which fit on the external thread or bolt.✓

(2 × 2) (4)

3.2 D = 0,613 × p
= 0,613 × 3,5✓
= 2,15 mm✓ (2)

[6]

QUESTION 4: HAND TOOLS

4.1 4.1.1 To drive in big pins (poles), keys and shafts

4.1.2 To hammer delicate workpieces with finished surfaces which can be easily damaged

4.1.3
- To rivet the ends of rivets and pins
- To shape hollow objects (Any ONE)

(3 × 1) (3)

4.2 To cut the groove wider than the thickness of the blade so that the blade will not be stuck in the groove (2)

4.3 The frame can bend. (1)

[6]

QUESTION 5: METALS AND PLASTICS

5.1
- Grey cast iron
- White cast iron (2)

5.2
- Wire ropes and laminated springs
- Screwdrivers, hammer heads, wood saws and spanners
- Dies for drop forging
- Heavy-duty forgings (4)

5.3
- Rapid cooling or quenching is required to harden the steel.
- If the steel is overheated it will cause grain growth and leave a weak and defective part.
- When heated the metal must reach a critical temperature. (3)

5.4 Annealing softens metal✓ and makes it suitable for bending,✓ drawing or other cold-working operations.✓ (3)

[12]

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QUESTION 6: MARKING OFF

6.1 To scribe lines on metal surfaces (1)

6.2 6.2.1
- Scribing arcs and circles
- Setting out or marking hole centres

6.2.2
- Scribing lines parallel to a reference face
- Finding the centre of a workpiece

(2 × 2) (4)
[5]

QUESTION 7: KEYS AND KEYWAYS

7.1
- Shaping machine
- Milling machine (with end mill or side and face cutter)
- Sink erosion (Any 2 × 1) (2)

7.2 t = D/6
= 60/6
= 10 mm✓ (d = t/2 d = 10/2 = 5 mm)

OR

D = d/12
= 60/12
= 5 mm✓ (2)

7.3 The key is used as a safety factor✓ in the driving system in the case of an overload. The key is made of mild steel✓ which is cheap to replace. (2)
[6]

QUESTION 8: FASTENERS

8.1
- Tighten the nut onto the bolt.
- Drill a hole just above the nut through the bolt.
- Insert the split pin into the hole and bend the legs back to prevent the split pin from falling out. (3)

8.2 Circlips are used to prevent the axial or end movement of parts. (1)
[4]

QUESTION 9: HAND TAPS, STOCKS, DIES AND REAMERS

9.1 The die actually cuts the thread✓ and the stock is used to hold and turn the die.✓ (2)

9.2 The die has an opening on one side so that small adjustments can be made to its size. (1)

9.3 The size of the die can be adjusted by turning the adjusting screw into the split to open the die a little more. (1)

9.4 A spanner (1)
[5]

TOTAL SECTION A: 60

SECTION B

QUESTION 10: DRILLING MACHINES

10.1
- Take off ties and tuck in loose clothing.
- Ensure that all guards are in place.
- Check that the drills are sharpened correctly.
- Check that the machine is operating correctly.
- Wear goggles.
- Place a piece of wood under drills being removed.
- Use only sharp drills.
- Clean metal shavings with a brush and not with the hands.
- Treat cuts and scratches immediately.
- Always remove the chuck key before turning on the power. (Any 4 × 1) (4)

10.2
10.2.1 Elevating motor
10.2.2 Spindle motor
10.2.3 Speed and feed gearbox
10.2.4 Arm
10.2.5 Machine table
10.2.6 Elevating screw

(6 × 1) (6)
[10]

QUESTION 11: GRINDING MACHINES AND MACHINE-CUTTING TOOLS

11.1
- Material to be grinded and its hardness
- Amount of material to be removed and the finish required
- Whether to do wet or dry grinding
- Wheel speed
- Area of grinding contact
- Severity of the grinding operation (Any 2 × 1) (2)

11.2
- Every pass removes a controlled amount of material from the wheel face.
- Diamonds last a long time.
- Diamonds wear slowly therefore the wheel face is parallel to the edge of the work rest. (Any 2 × 1) (2)

11.3
11.3.1 Shield
11.3.2 Grinding wheel
11.3.3 Work rest
11.3.4 Wheel guard
11.3.5 On/off switch
11.3.6 Pedestal

(6 × 1) (6)
[10]

QUESTION 12: THE CENTRE LATHE

12.1
12.1.1 Headstock
12.1.2 Carriage
12.1.3 Tailstock
12.1.4 Tool post
12.1.5 Apron
12.1.6 Lead screw

(6 × 1) (6)

12.2
- Rouging tool
- Screw-thread tool
- 45° chamfer tool
- Concave-radius tool
- Convex-radius tool
- Parting tool (Any 4 × 1) (4)

[10]

QUESTION 13: THE MILLING MACHINE

13.1
- Clean the machine after each work period.
- Never use an air hose to remove chips.
- Be very familiar with the machine before using it.
- Wear proper clothing and approved safety goggles.
- Stop the machine before making adjustments.
- Stop the machine before removing chips.
- Never reach over or near the rotating cutter.
- Ensure that the work-holding device is mounted solidly to the table and that it is holding the workpiece firmly.
- Do not talk to anyone while operating the machine or allow anyone to start the machine for you.
- Keep the floor around the machine clear of chips and wipe up spilled cutting fluid immediately.
- Place sawdust or an oil-absorbing compound on slippery floors.
- Be thoroughly familiar with the stop lever.
- Treat any cut and skin puncture immediately.
- Turn off all power to the machine before opening the door to the motor compartment.
- Do not run the saddle or work into the column.
- Use a heavy cloth for protection when handling milling cutters.

(Any 4 × 1) (4)

13.2 13.2.1 A machine vice is clamped on the bed of the milling machine and holds a workpiece for machining flats and slots.

13.2.2 A dividing head is used to drill holes, teeth, flats (like hexagons) and splines around the circumference on a round bar.

13.2.3 An adjustable tailstock is used to support a long workpiece in the dividing head between centres.

13.2.4 An adjustable boring head is used to cut drilled holes bigger to a specific size.

(4 × 1) (4)

13.3
- Vertical milling machine
- Horizontal milling machine
- Universal milling machine

(Any 2 × 1) (2)

[10]

TOTAL SECTION B: 40
GRAND TOTAL: 100

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